



# The quality of our shellfish waters and the challenges ahead

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Foras na Mara

# OVERVIEW

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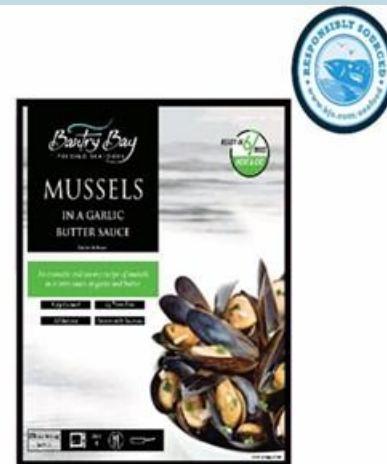
- ▶ Focus on the microbiological quality of bivalve molluscan shellfish (BMS)



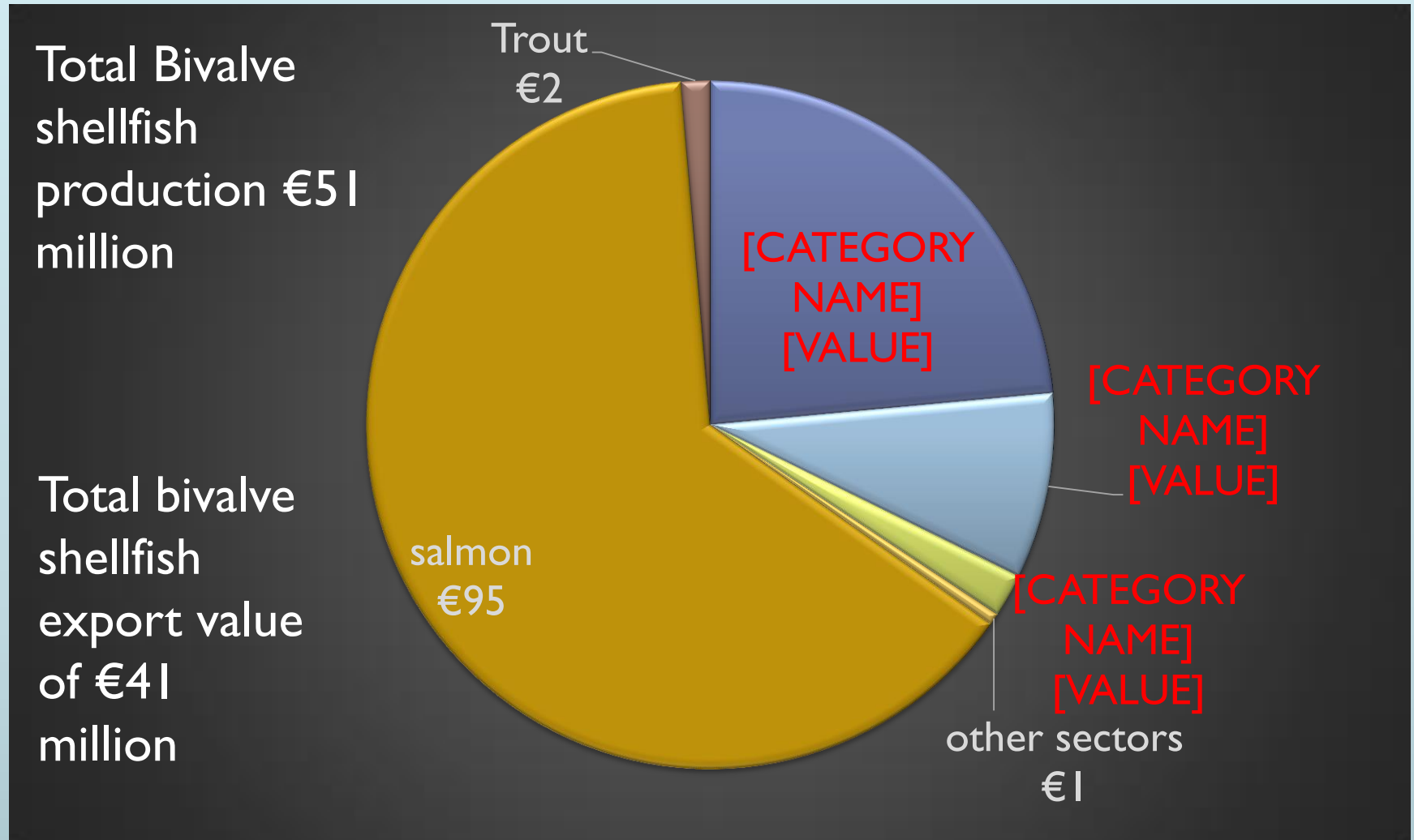
- ▶ Background to BMS and pressures on their microbiological quality.
- ▶ Assessing microbiological quality
  - ▶ Regulations
  - ▶ Environmental Vs Food Safety Assessment
- ▶ Future Challenges
  - ▶ Viruses in BMS



# Bivalve molluscan shellfish



# Irish Aquaculture Production by Value 2015 (Millions)



The Business of Seafood -Bord Iascaigh Mhara report 2016



# BMS are Filter Feeders...

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- ▶ An oyster can filter up to 7 litres per hour



- ▶ Two tanks containing the same water. The tank on right is shown 2 hours after adding oysters

# Key Pressures –Human Sources

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# Key Pressures –Animal Sources

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# Assessing the Microbiological Quality of Shellfish Waters



**Environment**  
Water Framework  
Directive



**Food Safety**  
EU Regulation

Based on same shellfish flesh monitoring data

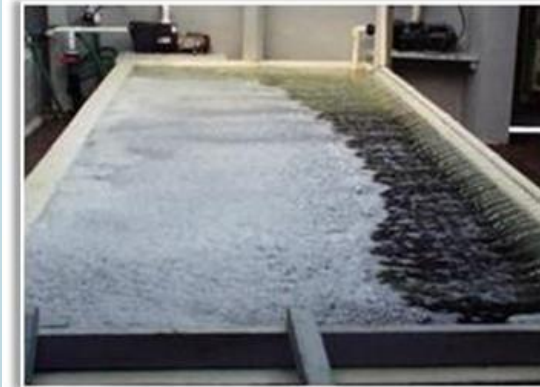
# Shellfish European Control Measures (Food)

Classification and monitoring  
of harvesting areas



EU reg.  
2004/854

Commercial processing  
(depuration, relaying, cooking)



EU reg.  
2004/853

End-product controls  
(quality tests, traceability)



EU reg.  
2004/853



# Harvest Area Classifications (EU reg. 2004/854)

Class.	<i>E. coli</i> levels (100g)	Treatment Required
A	<230 <i>in 80% of samples with no one result &gt;700 E. coli MPN per 100g</i>	None -Direct for human consumption
B	< 4,600	Purification Relaying in class A area Heat Treatment
C	< 46,000	Relaying in class A area cooking
Prohibited	>46 000	Harvesting not permitted

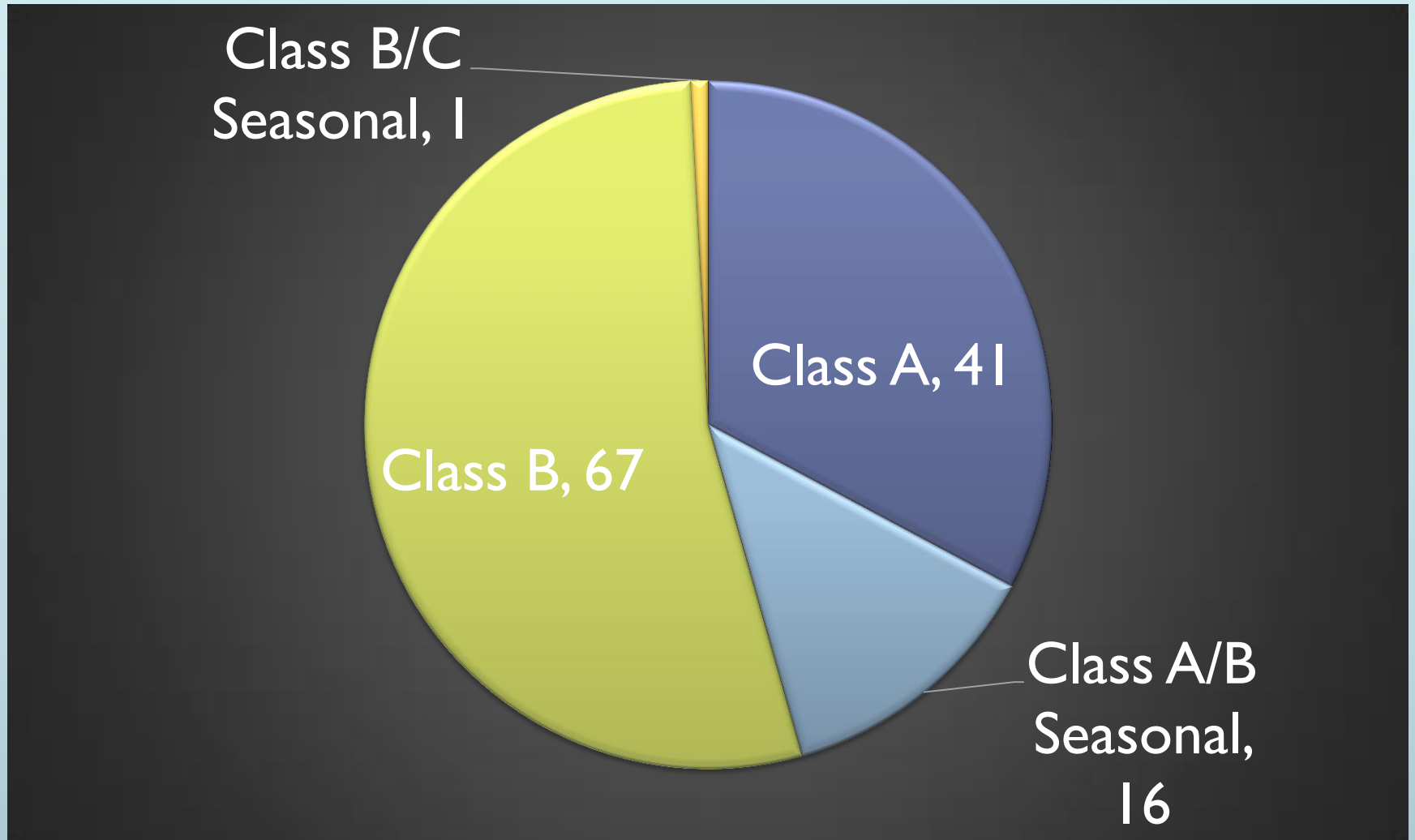
# Shellfish Classification Monitoring

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- ▶ Based on monthly sampling of shellfish production areas undertaken by Sea Fisheries Protection Authority (SFPA)
  - ▶ Approximately 1800 samples per year
- ▶ Testing organised by the MI
- ▶ Classifications made annually based on the previous three years monitoring data
- ▶ <http://www.sfpa.ie/SeafoodSafety/Shellfish/ClassifiedAreas.aspx>



# Number of Classified Areas 2016



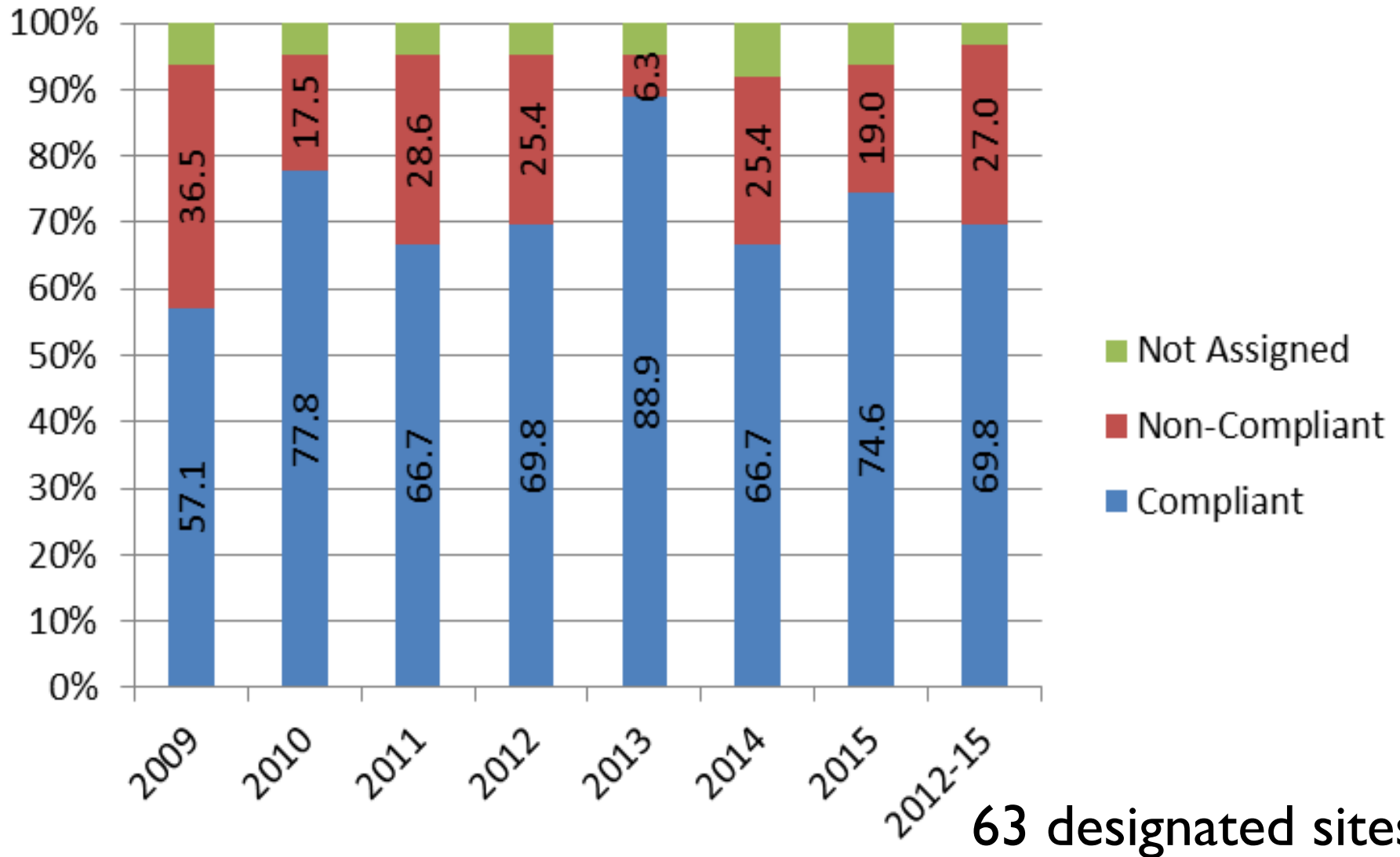
# Environmental Assessment

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- ▶ Water Framework Directive (Shellfish Waters Directive **2006/113/EC**)
  - ▶ 11 parameters
- ▶ Microbiological criteria based on *E. coli* data
  - ▶ Compliance standard  $\leq 230$  *E. coli* per 100g in 75% of samples based on quarterly sampling
  - ▶ Subset of classification monitoring data
- ▶ 63 designated areas
  - ▶ Characterisation reports
  - ▶ Pollution reduction plans



# WFD/SWD Site Microbiological (%) Compliance 2009-15





# Future Challenges -Human Pathogenic Viruses in Bivalve Molluscs

# Viruses In Bivalve Molluscs

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- ▶ Controls in Europe have virtually eliminated bacterial illness associated with shellfish consumption. However the risk of virus illness remains and outbreaks of illness continue to occur throughout Europe.....

# Virus illness outbreaks caused by oysters

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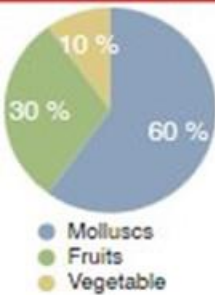
- Scandinavia, January 1997 (*J. of Shell. Res.* **17**(5):1633-1635)
  - **Gastro-enteritis** associated with **oysters**
  - Denmark: 356 cases recorded (Sweden, Netherlands and Germany)
  - Approx. 35,000 contaminated oysters sold in Denmark alone
- France and Italy, December 2002 (*Euro Surveill.* **9**(3): 24-6)
  - **Oysters** produced in France
  - France: 14 **gastro-enteritis** outbreak clusters, 69 confirmed cases; Italy: 200+ cases
- Europe Jan/March 2010 (*Euro Surveill.* **15**(12): 1-5)
  - 334 cases in 65 clusters in Sweden, UK, Norway, France and Denmark
  - **Oysters** produced in France, UK and Ireland
  - Winter 2010 cold and high **gastro-enteritis** activity in community



# Norovirus

- ▶ Relatively mild gastroenteritis (2-4 days duration)
  - ▶ *nausea, diarrhoea, vomiting, fever and abdominal pain*
- ▶ The most common cause of infectious intestinal disease in the community
- ▶ Seasonal distribution “Winter Vomiting Disease”
- ▶ Person to person spread
  - ▶ Highly infectious (<10 virus particles)

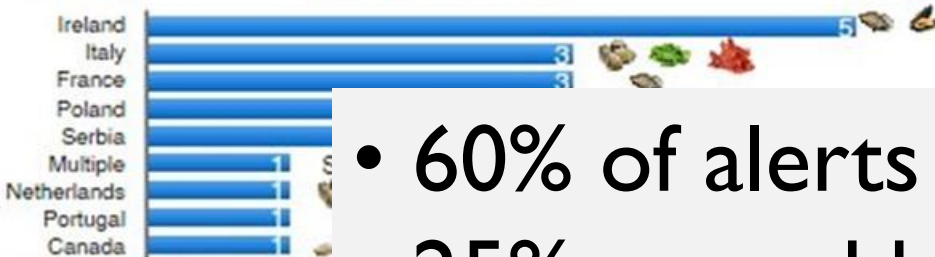
# VIRUS ALERTS ALL MATRICES - RASFF 2017



## Number of Virus Alerts in Europe

**20** Alerts

NoV 18  
HAV 2



## Countries of origin

Ireland		
Italy	Germany	
France	China	
Poland	Faroe Islands	
Serbia		Austria
	Spain	UAE
Netherlands		
Portugal	Hong Kong	Thailand
Canada	Greenland	Denmark
	Malta	Ukraine
	Monaco	Belgium
<b>26</b>		
<b>Potentially impacted countries</b>		

- 60% of alerts caused by BMS
- 25% caused by Irish BMS
- 90% caused by norovirus

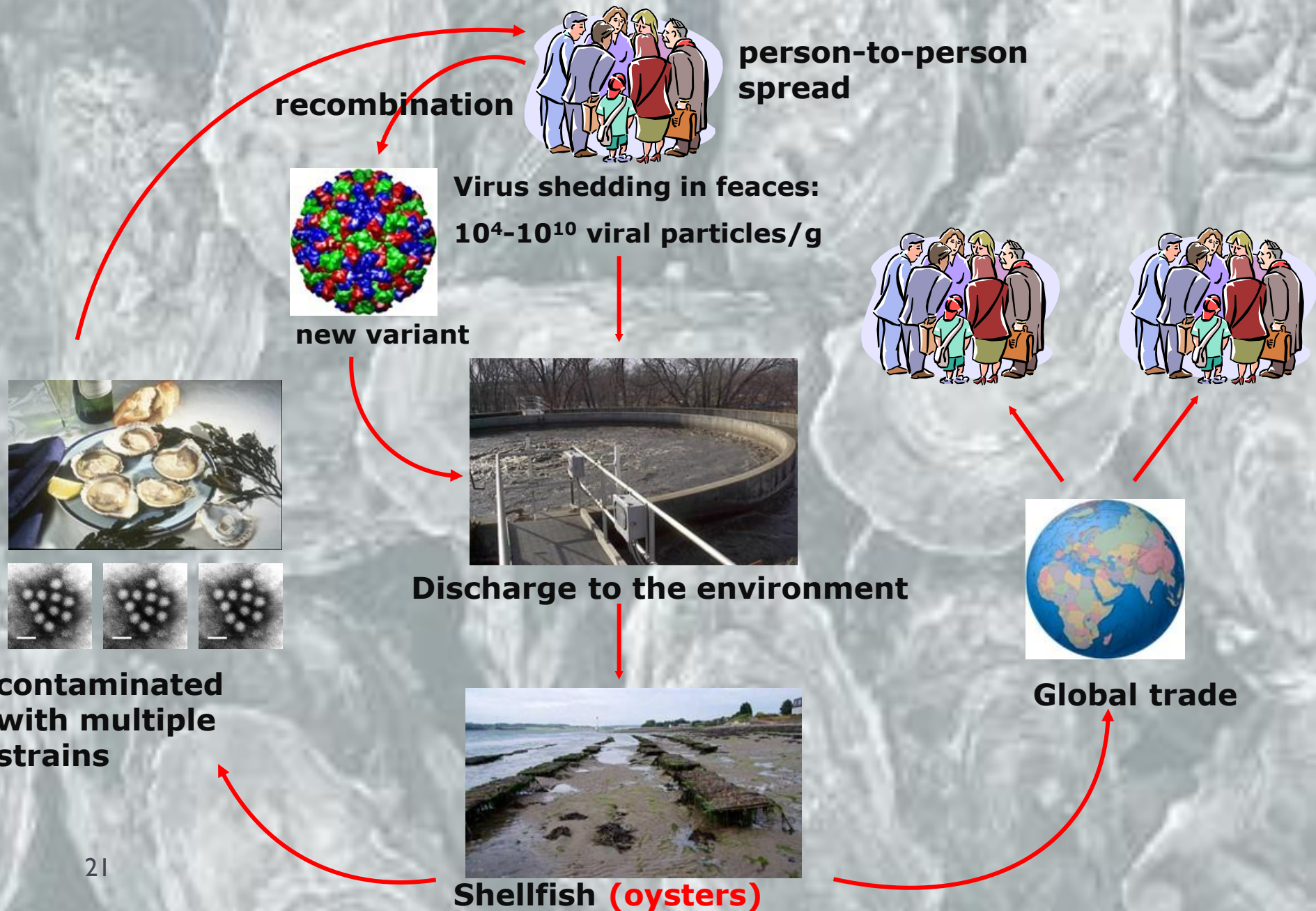
Strawberries	10 %
Clams	15 %
Raspberries	15 %
Spinach	5 %
SD tomatoes	5 %
Mussels	5 %
Geoduck	5 %



Data prepared by Ceeram tools (Biomérieux)



# Role of BMS in the spread of norovirus?



# No regulatory virus standard for BMS

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- ▶ EFSA opinion 2012 NoV in oysters
  - ▶ “.....risk managers should consider establishing an acceptable limit for NoV in oysters to be harvested and placed on the market.”
- ▶ NoV is commonly found in oysters during the winter months
  - ▶ Large UK study -76% oysters contained NoV but at low level
  - ▶ Molecular Method detects infectious and non-infectious virus and cannot determine infectious risk
- ▶ Standard based on presence / absence would have large economic impact on industry



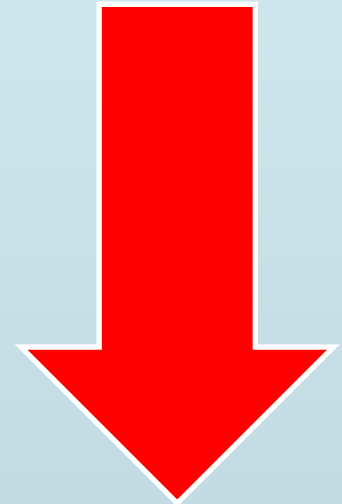
# Calculating the balance



**Benefit**  
**(food safety)**



**Cost**  
**(industry impact)**



<b>Benefit</b> <b>(difficult to do)</b>	<b>Cost</b> <b>(relatively easy)</b>
Dose response studies <ul style="list-style-type: none"><li>• Outbreak data</li><li>• Risk assessments</li><li>• Infectivity assessment</li></ul>	Prevalence and concentration in oysters <ul style="list-style-type: none"><li>• EU baseline survey</li></ul>

# European Baseline Survey of NoV in Oysters

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- ▶ European Food Safety Authority (EFSA)
  - ▶ [www.efsa.europa.eu/en/efsajournal/pub/4414](http://www.efsa.europa.eu/en/efsajournal/pub/4414)
  - ▶ 2 year survey (23 sites monthly in Ireland)
- ▶ Aim
  - ▶ To gather information on the extent of NoV contamination in European oysters
  - ▶ Establish the impact for industry of the introduction of a NoV standard in Europe
- ▶ Will not establish a safe or acceptable limit for NoV in shellfish
  - ▶ will not gather illness data
  - ▶ will not establish a threshold of infection
- ▶ <sup>24</sup> will not determine exposure levels for consumers

# NORORISK 2014-17 developing a risk assessment framework for norovirus in Irish oyster production areas

## Monitoring of the oyster production areas and end product

To assess the variation in NoV contamination in oysters over a production season.

## Laboratory depuration studies

- To develop a model to predict the reduction in NoV concentrations in oysters during depuration for varying time temperature combinations.

Exposure model

Risk assessment framework



# EPA Licence Requirements for Viruses

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- ▶ Licensee to carry out an assessment of the impact of the discharge(s) on the microbiological quality (including viruses) of the shellfish in the adjacent shellfish waters.
- ▶ Where the assessment indicates a deleterious microbiological (including viruses) effect the licensee shall install UV or other appropriate disinfection system.
- ▶ In response Irish Water undertaking desk studies for licensed discharges to determine impacts on adjacent shellfisheries
  - ▶ MI, BIM, SFPA are consultees
  - ▶ Several priority sites identified for further study



# Summary

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- ▶ Urban Wastewater Discharges cause a clearly identified impact on the microbiological quality of bivalve shellfish
  - ▶ This causes public health and economic impacts
- ▶ Two systems are in place to assess microbiological quality of BMS
  - ▶ Environmental (WFD/SWD) and food safety (EU regulation).
  - ▶ These systems use a common data source to make assessments.
- ▶ Norovirus (and other human viruses) in shellfish pose a particular public health risk that presents a significant future challenge
  - ▶ No regulatory standards exist
  - ▶ EPA and Irish Water recognise the problem and responding to the issue

The World is my  
oyster.....



.....But what is in  
your oyster?

